

1. A process for forming a low dielectric constant fluorine and carbon-containing silicon oxide dielectric material comprising reacting with an oxidizing agent one or more silanes comprising one or more organofluoro silanes having the formula  $\text{SiR}_1\text{R}_2\text{R}_3\text{R}_4$ , wherein:

(a)  $\text{R}_1$  is selected from the group consisting of H, a 3 to 5 carbon organo moiety, and an oxyorgano moiety;

(b)  $\text{R}_2$  is an organofluoro moiety; and

(c)  $\text{R}_3$  and  $\text{R}_4$  are independently selected from the group consisting of the same or different leaving group, the same or different organofluoro moiety, and the same or different  $((\text{L})\text{Si}(\text{R}_5)(\text{R}_6))_n(\text{R}_7)$ ; wherein n ranges from 1 to 5; L is O or  $(\text{C}(\text{R}_8)_2)_m$ ; m ranges from 1 to 4; each of the n  $\text{R}_5$ 's and n  $\text{R}_6$ 's is independently selected from the group consisting of the same or different leaving group and the same or different organofluoro moiety;  $\text{R}_7$  is selected from the group consisting of a leaving group and an organofluoro moiety; and each of the  $2n \cdot m$  or fewer  $\text{R}_8$ 's is selected from the group consisting of F and the same or different organofluoro moiety.

2. The process of claim 1 wherein  $\text{R}_1$  is H.

3. The process of claim 1, wherein  $\text{R}_1$  is selected from a 3 to 5 carbon organo moiety and an oxyorgano moiety.

4. The process of claim 1 wherein  $\text{R}_1$  is a 3 to 5 carbon organo moiety.

5. The process of claim 1 wherein  $\text{R}_1$  is an oxyorgano moiety.

6. The process of claim 1 wherein  $\text{R}_2$  is characterized by the absence of aliphatic C-H bonds.

7. The process of claim 1 wherein  $\text{R}_2$  consists essentially of C and F atoms.

8. The process of claim 7 wherein  $\text{R}_2$  has the formula  $\text{C}_x\text{F}_{2x+1}$ , where x ranges from 1 to 5.

9. The process of claim 1 wherein  $\text{R}_2$  comprises only a single carbon atom.

10. The process of claim 1 wherein  $\text{R}_2$  comprises 2 or more carbon atoms.

11. The process of claim 1 wherein  $R_3$  is  $((L)Si(R_5)(R_6))_n(R_7)$ .
12. The process of claim 11 wherein at least one of the  $n$   $L$ 's is  $O$ .
13. The process of claim 12 wherein each of the  $n$   $L$ 's is  $O$ .
14. The process of claim 11 wherein at least one of the  $n$   $L$ 's is  $(C(R_8)_2)_m$ .
15. The process of claim 14 wherein each of the  $n$   $L$ 's is  $(C(R_8)_2)_m$ .
16. The process of claim 15 wherein  $m$  is 2.
17. The process of claim 16 wherein  $m$  is 1.
18. The process of claim 17 wherein each of the  $n$   $L$ 's is  $CF_2$ .
19. The process of claim 1 wherein  $R_3$  is selected from the group consisting of an organo moiety and an oxyorgano moiety.
20. The process of claim 3 wherein  $R_3$  is selected from the group consisting of an organo moiety and an oxyorgano moiety.
21. The process of claim 20 wherein  $R_4$  is selected from the group consisting of an organo moiety and an oxyorgano moiety.
22. The process of claim 1 wherein  $R_1$  and  $R_4$  are  $H$ .
23. The process of claim 3 wherein  $R_3$  is  $H$ .
24. The process of claim 13 wherein  $R_1$  and  $R_4$  are  $H$ .
25. The process of claim 18 wherein  $R_1$  and  $R_4$  are  $H$ .

26. The process of claim 1 wherein said one or more organofluoro silanes comprise at least 1 silicon atom per 8 aliphatic hydrogen atoms.
27. The process of claim 1 wherein said one or more organofluoro silanes comprise at least 3 fluorine atoms per 8 aliphatic hydrogen atoms.
28. The process of claim 1 wherein said one or more organofluoro silanes comprise at least 1 fluorine atom per carbon atom.
29. The process of claim 1 wherein one or more of  $R_1$ ,  $R_2$ ,  $R_3$ , or  $R_4$  of said one or more organofluoro silanes comprise a first carbon atom linked to: (a) a second carbon atom and (b) a fluorine atom.
30. The process of claim 1 wherein one or more of  $R_1$ ,  $R_2$ ,  $R_3$ , or  $R_4$  of said one or more organofluoro silanes comprise a carbon atom bonded to from 1 to 2 fluorine atoms.
31. The process of claim 1 wherein said oxidizing agent is selected from the group consisting of ozone ( $O_3$ ), oxygen ( $O_2$ ), oxides of nitrogen ( $N_2O$ ,  $NO$ ,  $NO_2$ ), and combinations thereof.
32. The process of claim 31 wherein said oxidizing agent is ozone ( $O_3$ ).
33. The oxidizing agent of claim 1 wherein said oxidizing agent is hydrogen peroxide.

34. A process for forming a low dielectric constant fluorine and carbon-containing silicon oxide dielectric material comprising reacting with an oxidizing agent one or more silanes comprising one or more organofluoro silanes having the formula  $\text{SiR}_1\text{R}_2\text{R}_3\text{R}_4$ , wherein:

(a)  $\text{R}_1$  is selected from the group consisting of H, a 3 to 5 carbon organo moiety, and an oxyorgano moiety;

(b)  $\text{R}_2$  consists essentially of C and F atoms; and

(c)  $\text{R}_3$  and  $\text{R}_4$  are independently selected from the group consisting of the same or different leaving group, the same or different organofluoro moiety, and the same or different  $((\text{L})\text{Si}(\text{R}_5)(\text{R}_6))_n(\text{R}_7)$ ; wherein n ranges from 1 to 5; L is O or  $(\text{C}(\text{R}_8)_2)_m$ ; m ranges from 1 to 4; each of the n  $\text{R}_5$ 's and n  $\text{R}_6$ 's is independently selected from the group consisting of the same or different leaving group and the same or different organofluoro moiety;  $\text{R}_7$  is selected from the group consisting of a leaving group and an organofluoro moiety; and each of the  $2n*m$  or fewer  $\text{R}_8$ 's is selected from the group consisting of F and the same or different organofluoro moiety.

35. A process for forming a low dielectric constant fluorine and carbon-containing silicon oxide dielectric material comprising reacting with an oxidizing agent one or more silanes comprising one or more organofluoro silanes having the formula  $\text{SiR}_1\text{R}_2\text{R}_3\text{R}_4$ , wherein:

(a)  $\text{R}_1$  is H;

(b)  $\text{R}_2$  is an organofluoro moiety; and

(c)  $\text{R}_3$  is selected from the group consisting of the same or different leaving group, the same or different organofluoro moiety, and the same or different  $((\text{L})\text{Si}(\text{R}_5)(\text{R}_6))_n(\text{R}_7)$ ; wherein n ranges from 1 to 5; L is O or  $(\text{C}(\text{R}_8)_2)_m$ ; m ranges from 1 to 4; each of the n  $\text{R}_5$ 's and n  $\text{R}_6$ 's is independently selected from the group consisting of the same or different leaving group and the same or different organofluoro moiety;  $\text{R}_7$  is selected from the group consisting of a leaving group and an organofluoro moiety; and each of the  $2n*m$  or fewer  $\text{R}_8$ 's is selected from the group consisting of F and the same or different organofluoro moiety; and

(d)  $\text{R}_4$  is H.

36. A low dielectric constant fluorine and carbon-doped silicon oxide dielectric material for use in an integrated circuit structure comprising: silicon atoms bonded to oxygen atoms; silicon atoms bonded to carbon atoms; and carbon atoms bonded to fluorine atoms; wherein said dielectric material also has a characteristic selected from the group consisting of:

- 5           (a) the presence of at least one C-C bond;  
              (b) the presence of at least one carbon atom bonded to from 1 to 2 fluorine atoms; and  
              (c) the presence of at least one silicon atom bonded to from 0 to 2 oxygen atoms.

37. The low dielectric constant fluorine and carbon-doped silicon oxide dielectric material of claim 36 wherein said characteristic is the presence of at least one C-C bond, and at least one of the carbon atoms participating in said C-C bond is also bonded to at least one fluorine atom.

38. The low dielectric constant fluorine and carbon-doped silicon oxide dielectric material of claim 36 wherein all silicon atoms are bonded to at least 1 oxygen atom.

39. A low dielectric constant fluorine and carbon-doped silicon oxide dielectric material for use in an integrated circuit structure comprising the reaction product of an oxidizing agent and one or more silanes comprising one or more organofluoro silanes having the formula  $\text{SiR}_1\text{R}_2\text{R}_3\text{R}_4$ , wherein:

- 5           (a)  $\text{R}_1$  is selected from the group consisting of H, a 3 to 5 carbon organo moiety, and an oxyorgano moiety;  
              (b)  $\text{R}_2$  is an organofluoro moiety; and  
              (c)  $\text{R}_3$  and  $\text{R}_4$  are independently selected from the group consisting of the same or different leaving group, the same or different organofluoro moiety, and the same or  
 10           different  $((\text{L})\text{Si}(\text{R}_5)(\text{R}_6))_n(\text{R}_7)$ ; wherein n ranges from 1 to 5; L is O or  $(\text{C}(\text{R}_8)_2)_m$ ; m ranges from 1 to 4; each of the n  $\text{R}_5$ 's and n  $\text{R}_6$ 's is independently selected from the group consisting of the same or different leaving group and the same or different organofluoro moiety;  $\text{R}_7$  is selected from the group consisting of a leaving group and an organofluoro moiety; and each of the  $2n \cdot m$  or fewer  $\text{R}_8$ 's is selected from the group  
 15           consisting of F and the same or different organofluoro moiety.

40. A process for forming a low dielectric constant fluorine and carbon-containing silicon oxide dielectric material comprising reacting together a peroxide oxidizing agent and one or more silanes capable of reacting with said peroxide to form a film of said low k fluorine and carbon-containing silicon oxide dielectric material, said silanes comprising one or more organofluoro silanes having the formula  $\text{SiR}_1\text{R}_2\text{R}_3\text{R}_4$ , wherein:

(a)  $\text{R}_1$  is selected from the group consisting of H, a 3 to 5 carbon organo moiety, and an oxyorgano moiety;

(b)  $\text{R}_2$  is an organofluoro moiety; and

(c)  $\text{R}_3$  and  $\text{R}_4$  are independently selected from the group consisting of the same or different leaving group, the same or different organofluoro moiety, and the same or different  $((\text{L})\text{Si}(\text{R}_5)(\text{R}_6))_n(\text{R}_7)$ ; wherein n ranges from 1 to 5; L is O or  $(\text{C}(\text{R}_8)_2)_m$ ; m ranges from 1 to 4; each of the n  $\text{R}_5$ 's and n  $\text{R}_6$ 's is independently selected from the group consisting of the same or different leaving group and the same or different organofluoro moiety;  $\text{R}_7$  is selected from the group consisting of a leaving group and an organofluoro moiety; and each of the  $2n \cdot m$  or fewer  $\text{R}_8$ 's is selected from the group consisting of F and the same or different organofluoro moiety.